IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

SIEMENS MEDICAL SOLUTIONS USA, INC.,	)	
Plaintiff,	)	C.A. No. 07-190 (SLR)
v.	)	**REDACTED VERSION**
SAINT-GOBAIN CERAMICS & PLASTICS, INC.,	)	
Defendant.	)	

AFFIDAVIT OF NIRAJ DOSHI

MORRIS, NICHOLS, ARSHT & TUNNELL LLP
Jack B. Blumenfeld (I.D. No. 1014)
Maryellen Noreika (I.D. No. 3208)
1201 North Market Street
P.O. Box 1347
Wilmington, DE 19899
(302) 658-9200
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Attorneys for Plaintiff
Siemens Medical Solutions USA, Inc.

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Charanjit Brahma
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(202) 879-5000

Original Filing: July 9, 2007
Redacted Filing: July 16, 2007

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

SIEMENS MEDICAL SOLUTIONS USA, INC.,	)	
Plaintiff,	)	Civil Action No. 07-190 SLR
v.	)	
SAINT-GOBAIN CERAMICS & PLASTICS, INC.,	)	
Defendant.	)	

AFFIDAVIT OF NIRAJ DOSHI

I, Niraj Doshi, hereby declare:

1. I am presently employed by Siemens Medical Solutions, Inc. ("Siemens") and have been employed by Siemens or its predecessor, CTI, Inc. since July 2000.

2. I have a Ph.D. in Biomedical Physics from the University of California, Los Angeles (UCLA).

3. On or about December 6, 2006, Siemens requested from the University of Tennessee samples of lutetium-yttrium orthosilicate ("LYSO") crystals manufactured by Saint-Gobain Ceramics & Plastics, Inc. ("Saint-Gobain") or its corporate affiliates. On or about February 14, 2007, Siemens received samples that had been sold to the University of Tennessee by Saint-Gobain along with what is, to the best of my knowledge, the March 24, 2004, invoice (Exhibit A) under which these sample LYSO crystals were sold to the University by Saint-

Gobain. To the best of my knowledge, the quotation from Saint-Gobain to the University for this sale is attached as Exhibit B. The quotation indicates that the sample LYSO crystals from Saint-Gobain were produced in France.

4. I and others under my supervision at Siemens tested these sample LYSO crystals to determine how similar their scintillation properties were to those of Siemens' patented lutetium oxyorthosilicate ("LSO") crystals. Particularly, Saint-Gobain's LYSO crystals were tested and compared to Siemens' LSO crystals for the following properties:

- density
- light output
- energy resolution
- excitation spectra
- emission spectra
- radioluminescence
- decay time

The results of these experiments are discussed below in paragraphs 8-14.

5. The sample LYSO crystals obtained from Saint-Gobain were processed in the same manner as the LSO crystals Siemens uses in its own PET scanners. The two LYSO crystals were 1x1x0.5 cm, with no surface finishing (as cut).

6. The tests performed by Siemens to measure these properties of the sample LYSO crystals were the same as those typically performed by Siemens on the LSO crystals Siemens uses in its own PET scanners. Thus, data for each of the characteristics listed above has also

been provided for Siemens' LSO crystals for purposes of determining whether the performance of LYSO crystals is substantially similar. In order to maintain a relative comparison standard, LSO pixels taken from Siemens' production were tested on the same apparatus as that used to test the LYSO. Siemens' also maintains a database of crystal slab measurements (including energy resolution and light output) as part of its quality control program. These slabs are then cut into pixels which are then classified based on their light output characteristics into 5 categories.

7. Siemens also sent portions of the sample crystals to an outside laboratory for destructive testing to determine the composition of the crystal. The report of that laboratory is attached as Exhibit C. The report indicates that the amount of yttrium in the LYSO crystals tested is approximately 4% by weight.

8. To measure the density of the sample LYSO crystals, each crystal was weighed three times. Using the buoyancy technique, samples of the LYSO were measured in air (dry mass) and in water (wet mass) at a known temperature in order to calculate their density. The relationship between dry mass and wet mass is based on the Archimedes' principle. In this case the formula is (dry mass * density of water at specific temperature) / (dry mass – wet mass). Taking an average of the three measurements for each crystal, the two sample LYSO crystals had densities of 7.13 and 7.09 g/cc. The raw weight measurements for the sample LYSO crystals are provided in the table attached as Exhibit D. In comparison, the average density of one of Siemens' LSO crystals is [redacted].

9. To measure light output the samples were excited by a standard cesium-137 gamma ray source. The scale used for the light output measurements is expressed in arbitrary units, with

the light output of bismuth germinate ("BGO") being assigned a light output value of 100. Two of Saint-Gobain's crystals and four of Siemens' crystals were tested in this manner. These tests on the two Saint-Gobain crystals showed light outputs of 573 and 564. For comparison, the tests on the four Siemens' crystals showed light outputs of [redacted] and [redacted] The raw measurements for these tests are provided in the table attached as Exhibit E.

10. From the light output tests, the energy resolution was calculated as the full width at half maximum of the 662 KeV gamma ray peak. Two of Saint-Gobain's crystals and four of Siemens' crystals were tested in this manner. The energy resolution for the tests on the two Saint-Gobain crystals showed energy resolutions of 8.1 and 9.4 percent. For comparison, the energy resolution for the tests on the four Siemens' crystals showed energy resolutions of [redacted] and [redacted] and [redacted] percent. The raw measurements for these tests are provided in the table attached as Exhibit E.

11. The excitation spectra of the sample crystals was characterized for ~420 nm emissions. The crystals were exposed to 250-400 nm wavelengths. Two of Saint-Gobain's crystals and four of Siemens' crystals were tested in this manner. A graph showing the results for these tests is included in Exhibit F. The data was normalized to the highest intensity peak for each crystal spectra.

12. The emission spectra of the sample crystals upon excitation by ultraviolet light was characterized in two tests, one using 300 nm excitation and another using 350 nm excitation. Two of Saint-Gobain's crystals and four of Siemens' crystals were tested in this manner. Graphs showing the results for these tests are included in Exhibit G. Again, the data was normalized to the highest intensity peak.

13. Radioluminescene measurements for the sample crystals were taken using a 35-kV, 100-μA, x-ray generator, and the emission intensity was measured along with the emission wavelength. Two of Saint-Gobain's crystals and two of Siemens' crystals were tested in this manner. A graph showing the results for these tests is included in Exhibit H. The data was normalized to 1 for intensity.

14. To measure the scintillation decay time for the crystals, crystal samples were excited with standard cesium-137 and the intensity of emissions was measured versus time. A time-correlated, single photon technique was used. Scintillation decay is exponential, and scintillation decay time is defined as the time required for scintillation emissions to decrease to 1/e of the maximum emission intensity. The following equation was fit to the data points to determine the scintillation decay time, t_1:

$$y = A1*\exp(-x/t_1) + y0$$

Two of Saint-Gobain's crystals and two of Siemens' crystals were tested in this manner. The resulting graphs and calculations for these four tests are included in Exhibit I. For Saint-Gobain's two sample LYSO crystals, the calculated decay times were 39.2 and 39.9 nanoseconds. For Siemens' two LSO sample crystals, the calculated decay times were [redacted] and [redacted] nanoseconds.

15. Based on my knowledge of the industry, I am unaware of any scintillation crystal manufacturer other than Saint-Gobain that is offering LYSO crystals in commercial quantities and grades. The basis of this knowledge comes from industry contacts, review of scientific literature, trade journals, and conferences and meetings.

I hereby declare, under penalty of perjury, that the foregoing statements are true and correct to the best of my personal knowledge.

Date: June 25, 2007

Niraj Doshi, Ph.D.

State of Tennessee: SS

Subscribed and sworn before me, in my presence, this 25 day of June, 2007.

Notary Public, Knox County, TN

My commission expires 02-03-2010.

JOY M. PAVLIS
STATE OF TENNESSEE NOTARY PUBLIC
KNOX COUNTY
My Commission Expires February 3, 2010

CERTIFICATE OF SERVICE

I, the undersigned, hereby certify that on July 9, 2007, I electronically filed the foregoing with the Clerk of the Court using CM/ECF, which will send notification of such filing(s) to the following:

Jesse A. Finkelstein, Esquire
Jeffrey L. Moyer, Esquire
Kelly E. Farnan, Esquire
Richards, Layton & Finger, P.A.

I also certify that copies were caused to be served on July 9, 2007 upon the following in the manner indicated:

BY EMAIL & HAND

Jesse A. Finkelstein, Esquire
Jeffrey L. Moyer, Esquire
Kelly E. Farnan, Esquire
Richards, Layton & Finger, P.A.
One Rodney Square
Wilmington, DE 19801

BY EMAIL

Frederick L. Whitmer, Esquire
Thelen Reid Brown Raysman & Steiner LLP
875 Third Avenue
New York, NY 10022

/s/ Jack B. Blumenfeld

Jack B. Blumenfeld (#1014)

CERTIFICATE OF SERVICE

I, the undersigned, hereby certify that on July 16, 2007, I electronically filed the foregoing with the Clerk of the Court using CM/ECF, which will send notification of such filing(s) to the following:

Jesse A. Finkelstein, Esquire
Jeffrey L. Moyer, Esquire
Kelly E. Farnan, Esquire
Richards, Layton & Finger, P.A.

I also certify that copies were caused to be served on July 16, 2007 upon the following in the manner indicated:

BY ELECTRONIC MAIL and HAND DELIVERY

Jesse A. Finkelstein, Esquire
Jeffrey L. Moyer, Esquire
Kelly E. Farnan, Esquire
Richards, Layton & Finger, P.A.
One Rodney Square
Wilmington, DE 19801

BY ELECTRONIC MAIL

Frederick L. Whitmer, Esquire
Thelen Reid Brown Raysman & Steiner LLP
875 Third Avenue
New York, NY 10022

/s/ Maryellen Noreika (#3208)
Maryellen Noreika (#3208)

EXHIBIT A

SAINT-GOBAIN
CRYSTALS & DETECTORS

801 COCHRAN ROAD, SOLON, OH 44139
TELEPHONE (440) 349-7400 FAX (440) 349-6581
Saint-Gobain Ceramics & Plastics, Inc.

REMIT TO P.O. BOX 641218 Pittsburgh, PA 15264-1228

Invoice / Sales Order	Date	NO. 330NUMBER. 1/1 PAGE 1 OF 1
	1/07/04	78771

Ship Via UPS
F.O.B. NEWBURY, OHIO
Ship Term PREPAID

Bill To:
2637 UNIVERSITY OF TENNESSEE
NUCLEAR ENGINEERING
1004 ESTABROOK

KNOXVILLE TN 37996

Ship To:
UNIVERSITY OF TENNESSEE
ATTN: WILLIAM F.HOLIWAY
308 DAUGHERTY HALL

KNOXVILLE TN 37996

Payment Terms	Sales Rep #	Cust PO
VISA	200	VISA

Line	Qty	Part Number	Description	Unit Price	Value
			FAX: 865-974-0880 WILLIAM HOLIWAY		
			PHONE: 865-974-5264		
			GM-03-3584		
			VISA 4715 7804 0000 5232 EXP 01/05		
10	2	100-1769	LYSO 5mm X 10mm X 10mm	1000.000	2000.00

Approved 010843

ALL FUNDS PAYABLE IN US $ UPS # 1Z 490 752 034 435 69 19

Sale Amount	2000.00
Misc Amount	.00
Sales Tax	.00
Freight	.00
TOTAL	2000.00

THESE COMMODITIES LICENSED BY THE UNITED STATES FOR ULTIMATE DESTINATION AND FOR DISTRIBUTION OR RESALE IN DIVERSION CONTRARY TO U. S. LAW PROHIBITED. USA unless otherwise designated.

FOR EXPORT ONLY

United States law prohibits disposition of these commodities to communist controlled areas of Vietnam and Cambodia, Cuba or North Korea, unless otherwise authorized by the United States.

UNLESS OTHERWISE NOTED, INTEREST OF 1 1/2% PER MONTH OR 18% PER ANNUM WILL BE CHARGED ON ANY UNPAID BALANCE PAST DUE. The goods covered by this document were manufactured in compliance with the Fair Labor Standards Act of 1938, as amended.

ORIGINAL INVOICE

INVOICE

SAINT-GOBAIN
CRYSTALS & DETECTORS
Saint-Gobain Ceramics & Plastics, Inc.

12345 KINSMAN RD, NEWBURY, OH 44065
TEL 440-564-2251 FAX 440-564-8047

Sales Order		
Packing List	3/23/04	78771
Order	1/07/04	

Ship Via UPS
F.O.B. NEWBURY, OHIO
Ship Term PREPAID

Ship To:
UNIVERSITY OF TENNESSEE
ATTN: WILLIAM F.HOLIWAY
308 DAUGHERTY HALL

KNOXVILLE TN 37996

Payment Terms	Sales Rep #	Cust PO
VISA	4200	VISA

Line	Order Qty.	Backord Qty.	U/M	Part Number	Description	Shipped Qty
	FAX: 865-974-0880 WILLIAM HOLIWAY					
	PHONE: 865-974-5264					
	GM-03-3584					
10	2.0	.0	EA	100-1769	LYSO 5mm X 10mm X 10mm Crystals	2.0

Charge to R011316041 - 4001550

No of Cartons 1 Weight 3# Carrier UPS Air 293 Date Shipped 3/23/04

Remarks: 15x11x12

PACKING LIST

EXHIBIT B

SAINT-GOBAIN

CRYSTALS & DETECTORS

QUOTATION

TO: ~~Claudia Rawn~~
~~University Of Tennessee~~
~~Nuclear Engineering Dept~~
~~315 Pasqua Engr Bldg~~
~~Knoxville, TN 37996-2300~~
~~USA~~

Univ of Tennessee
Attn: William F. Holiway
308 Dougherty Hall
Knoxville, TN
37996

QUOTATION NO.: GM-03-3584

CUSTOMER REF #:

DATE: December 08, 2003

PAYMENT TERMS: Net 30

SHIPPING TERMS: ~~FOB Newbury~~
* UTK Destination

FAX NO.: +1 (865) 9744115

PHONE: +1 (865) 974-5340

Please refer to top quote # when placing order.

* Thanks for taking care of shipping.

Customer Notes:

ITEM	QTY	DESCRIPTION	UNIT PRICE US $	TOTAL PRICE US $
1	2	LYSO 5mmx10mmx10mm Not Polished → rec 3/25/04	$ 1,000.00	$ 2,000.00
		Shipment after receipt of order in 8-10 Weeks Minimum Order Amount $500.00 NOTE: Lead times are based on our current workloads. A firm delivery date will provided at the time of order.	TOTAL :	$ 2,000.00

NOTE: The prices quoted herein are valid for: 60 days

Product contains 100% new material.

Country of Origin: France

Scintillation Materials: France

Assembly & Test:

By: Margaret DeLuca, Customer Service Representative
Saint-Gobain Crystals & Detectors

cc: David Stadelman Dominique Rothan Sandra Clarke

Saint-Gobain Crystals & Detectors
12345 Kinsman Road Newbury, Ohio 44065 Tel: (440) 564-2251 Fax: (440) 564-8047
Saint-Gobain Ceramics & Plastics, Inc.

EXHIBIT C

TEST REPORT

NORTHERN ANALYTICAL LABORATORY, INC.
23 Depot St., Merrimack, NH 03054
Phone: (603) 429-9500
FAX: (603) 429-9471

Dr. Piotr Szupryczynski
Siemens Medical Solutions, USA
Molecular Imaging
203 Dunavant Dr.
Rockford, TN 37853

RECEIVED	2/26/07	**SAMPLE NUMBER**	GI35782
IDENT AS	See below	**REPORT DATE**	2/27/07
MATERIAL	$(LuY)_2SiO_5$	**PAGE**	1 of 1
CONDITION	Solid	**CLIENT ORDER**	
TEST TO			
TEST PER	TP-ICP1		

Method: **ICP-MS analysis**

Sample I.D.	**Y(wt%)**
24 LYS 013-1 S#2	4.14 ± 0.1

Analysis By: Peter S. Dickson
Analytical Chemist

Approved By: William A. Guidoboni
Sr. Analytical Chemist

NADCAP Performance Review Institute Accredited

ISO 9001:2000 AS9100 Registered Firm

Glow Discharge Mass Spectroscopy

NORTHERN ANALYTICAL LABORATORY, INC.

23 Depot St., Merrimack, NH 03054
Phone: (603) 429-9500 FAX: (603) 429-9471
www.northernanalytical.com

SAMPLE NO.	GI35782
FILE NO.	4SIEM1
DATE:	2/27/2007

Piotr Szupryczynski Ph.D. Lu2SiO5
Siemens Medical Solutios
203 Dunavant Dr. PO #
Rockford, TN 37853 # 24LYS013-2

ANALYSIS	ppmw	ANALYSIS	ppmw	ANALYSIS	ppmw
~~H~~		Zn	<0.5	Pr	0.03
Li	<0.05	Ga	<0.5	Nd	0.07
Be	<0.05	Ge	<0.5	Sm	0.09
B	0.09	As	<0.5	Eu	0.70
~~C~~		Se		Gd	0.30
~~N~~		Br		Tb	0.65
O	Major	Rb		Dy	0.20
~~F~~	<1	Sr		Ho	0.52
Na	0.75	Y	Major	Er	0.10
Mg	0.15	Zr	0.15	Tm	0.04
Al	1.9	Nb	<0.1	Yb	14
Si	Major	Mo	≤0.1	Lu	Major
P	0.35	Ru		Hf	<0.1
S	2.5	Rh		Ta	<5
Cl	6.0	Pd		W	<0.5
K	0.40	Ag	<0.5	Re	
Ca	6.0	Cd		Os	
Sc	<0.1	In		Ir	≤0.5
Ti	0.16	Sn	0.15	Pt	<0.5
V	0.01	Sb	<0.1	Au	<5
Cr	0.20	Te	<0.5	Hg	
Mn	0.020	I		Tl	
Fe	1.1	Cs		Pb	0.04
Co	<0.05	Ba	<0.5	Bi	≤0.1
Ni	0.065	La	0.10	Th	<0.01
Cu	≤0.1	Ce	600	U	0.10

All other elements <0.1ppmw, each

ANALYSIS BY: William A. Guidoboni/ Sr. Analytical Chemist
Name/Function

APPROVED BY: Richard J. Guidoboni / President
Name/Function

EXHIBIT D

Measurements on Saint Gobain Crystals

Sample ID	Dry Mass [g]	Wet Mass [g]	Water Density at 22.3C	Crystal Density [g/cc]
Saint Gobain 013-1#1	3.7213	3.2007	0.997704942	7.13169305
Saint Gobain 013-1#2	3.7213	3.2004	0.997704942	7.12758572
Saint Gobain 013-1#3	3.7211	3.2004	0.997704942	7.129940197
			Average:	7.129739656
Saint Gobain 013-2#1	3.7204	3.1969	0.997704942	7.090470806
Saint Gobain 013-2#2	3.7203	3.1972	0.997704942	7.095701963
Saint Gobain 013-2#3	3.7201	3.1972	0.997704942	7.098034339
			Average:	7.094735703

EXHIBIT E

Relative Light Output Measurements

Cs137 (662eV)

Sample ID	**Light Output** (photopeak position) [ch MCA]	**FWHM** [ch MCA]	**ER** ΔE/E [%]
LYSO Saint Gobain 013-01	573	53.93	9.411867
LYSO Saint Gobain 013-02	564	45.87	8.132979
LSO Ref#1	[redacted]	[redacted]	[redacted]
LSO Ref#2			
LSO Ref#3			
LSO Ref#4			
BGO	100	11.92	11.92

EXHIBIT F

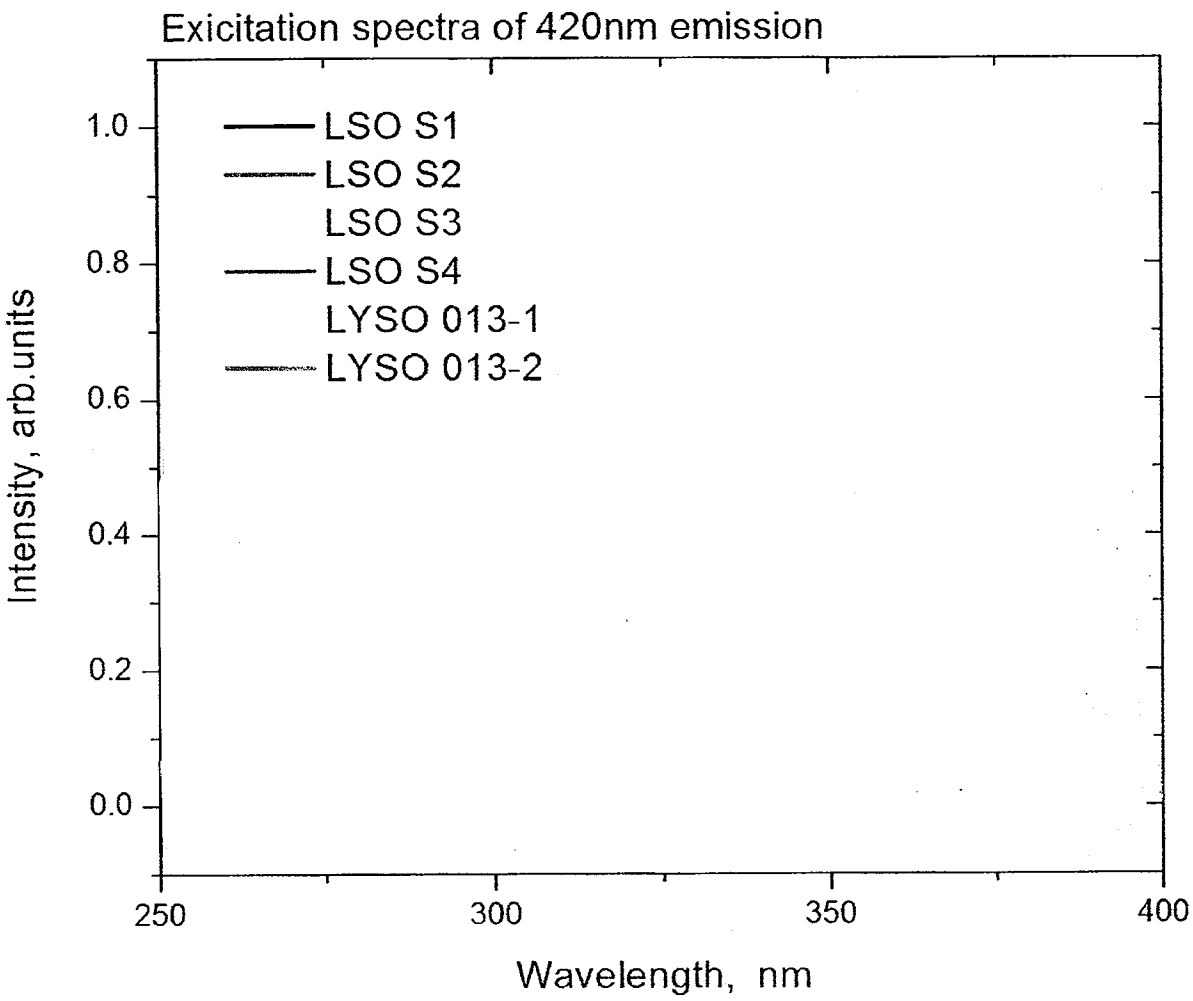
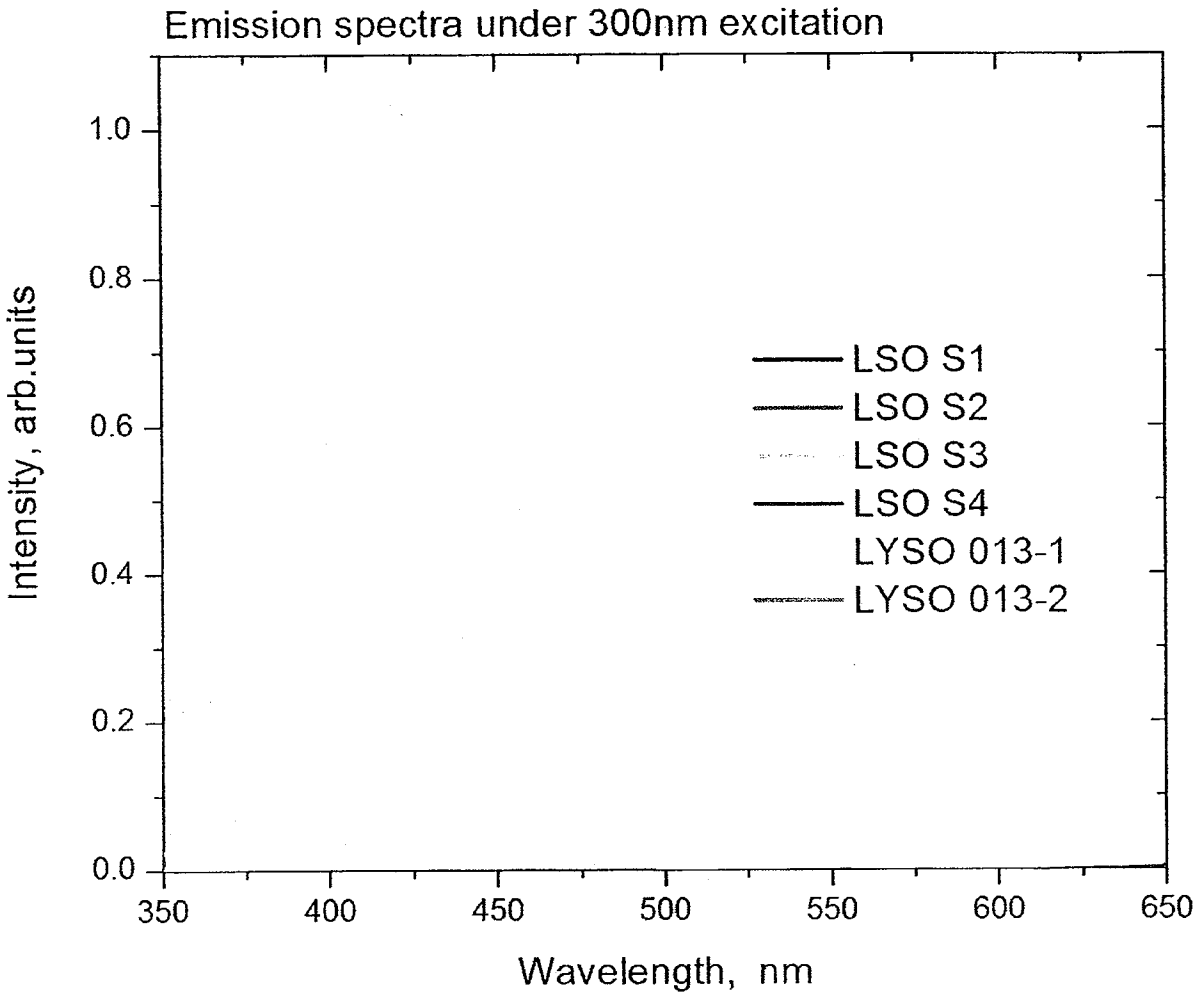

Exicitation spectra of 420nm emission
LSO S1
LSO S2
LSO S3
LSO S4
LYSO 013-1
LYSO 013-2
Intensity, arb.units
1.0
0.8
0.6
0.4
0.2
0.0
250
300
350
400
Wavelength, nm

EXHIBIT G


Emission spectra under 300nm excitation
Intensity, arb.units
1.0
0.8
0.6
0.4
0.2
0.0
350
400
450
500
550
600
650
Wavelength, nm
LSO S1
LSO S2
LSO S3
LSO S4
LYSO 013-1
LYSO 013-2

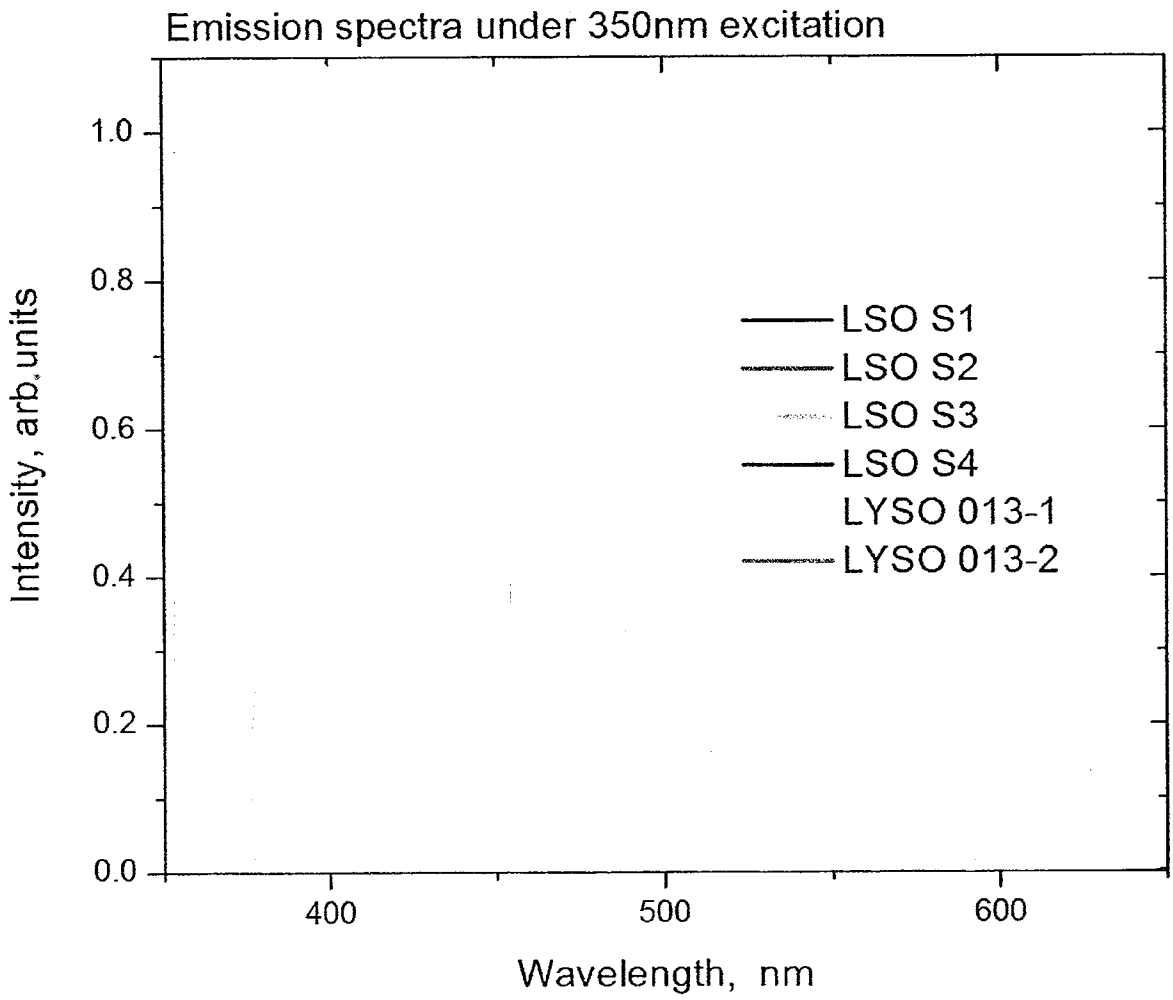

Emission spectra under 350nm excitation
Intensity, arb. units
1.0
0.8
0.6
0.4
0.2
0.0
400
500
600
Wavelength, nm
LSO S1
LSO S2
LSO S3
LSO S4
LYSO 013-1
LYSO 013-2

EXHIBIT H

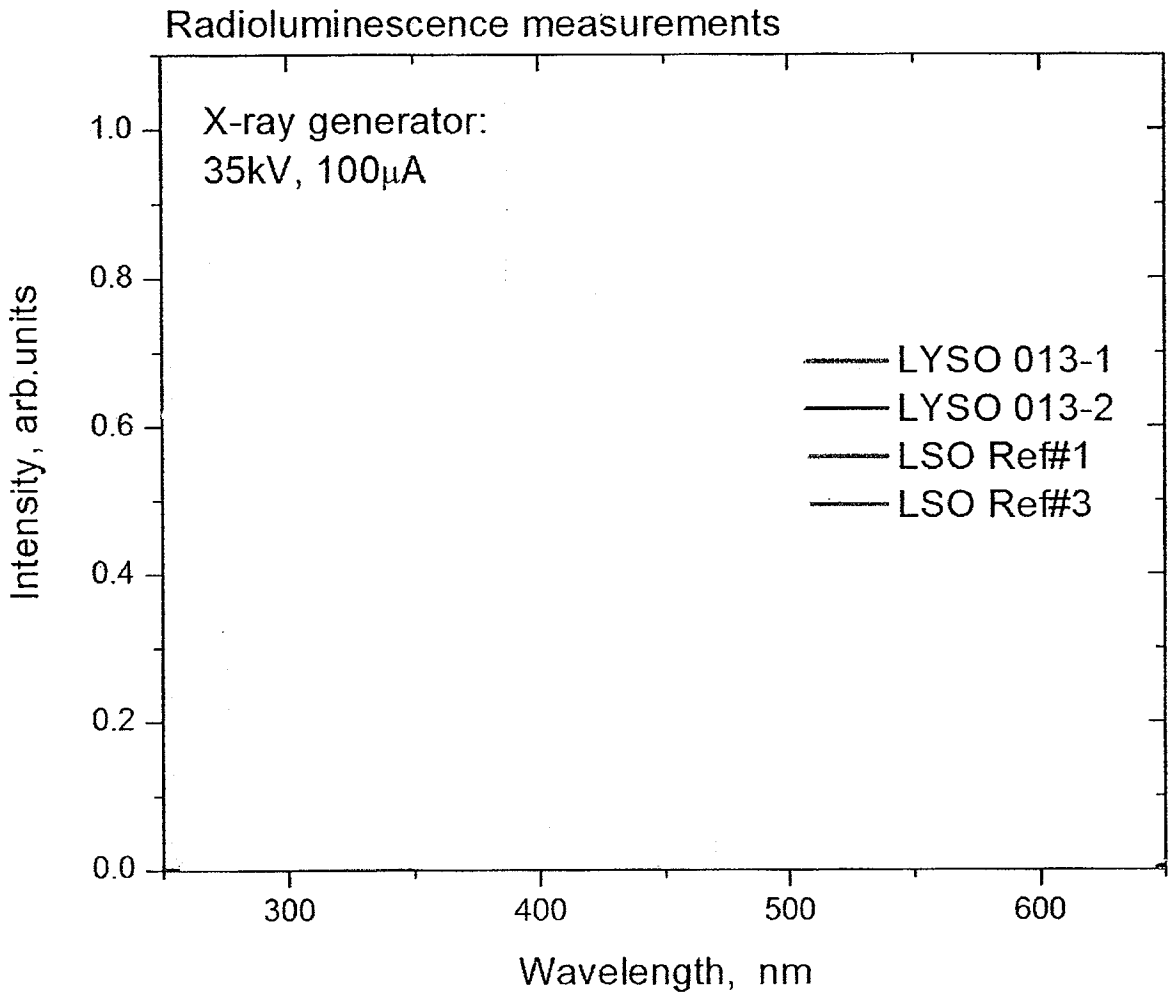
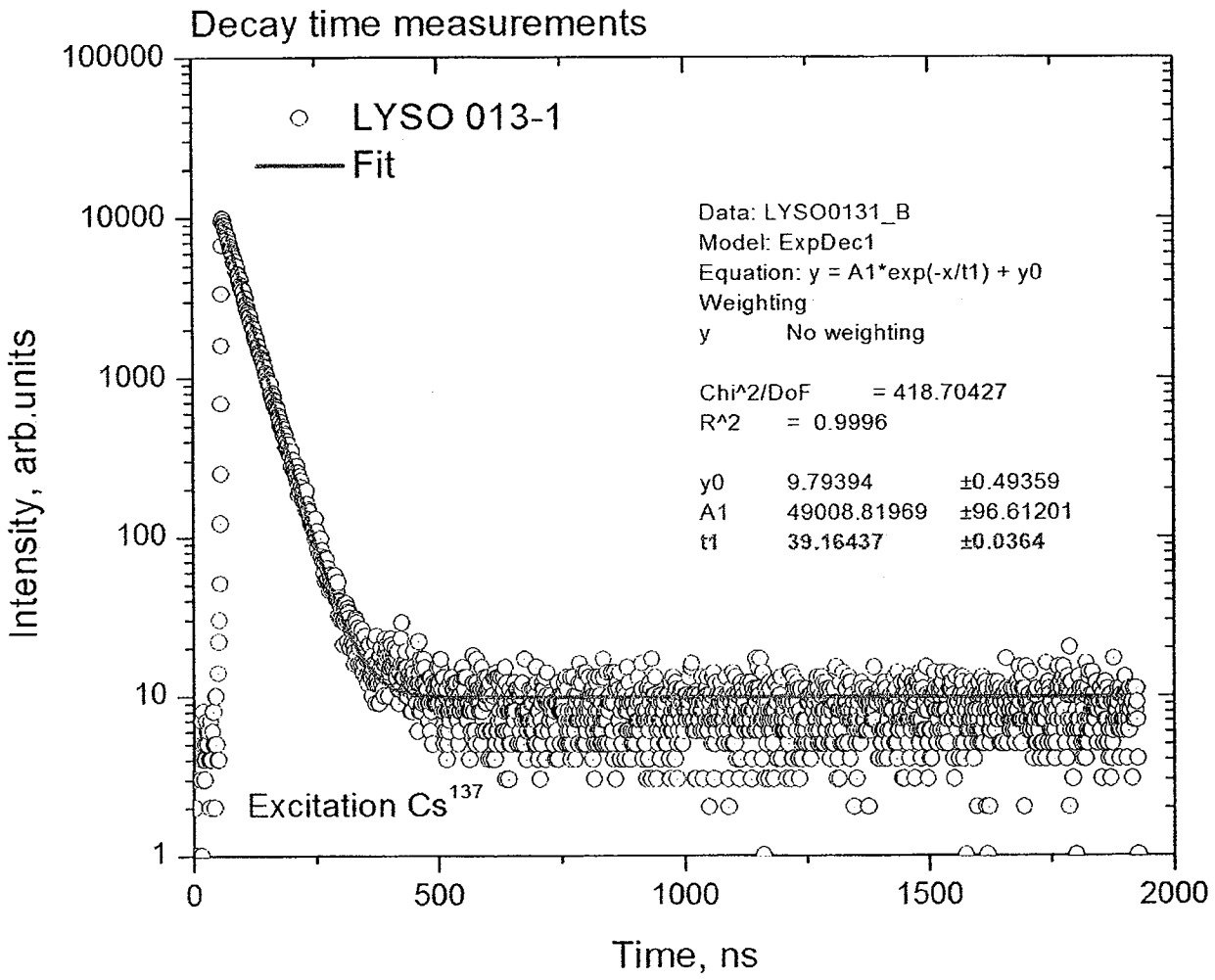
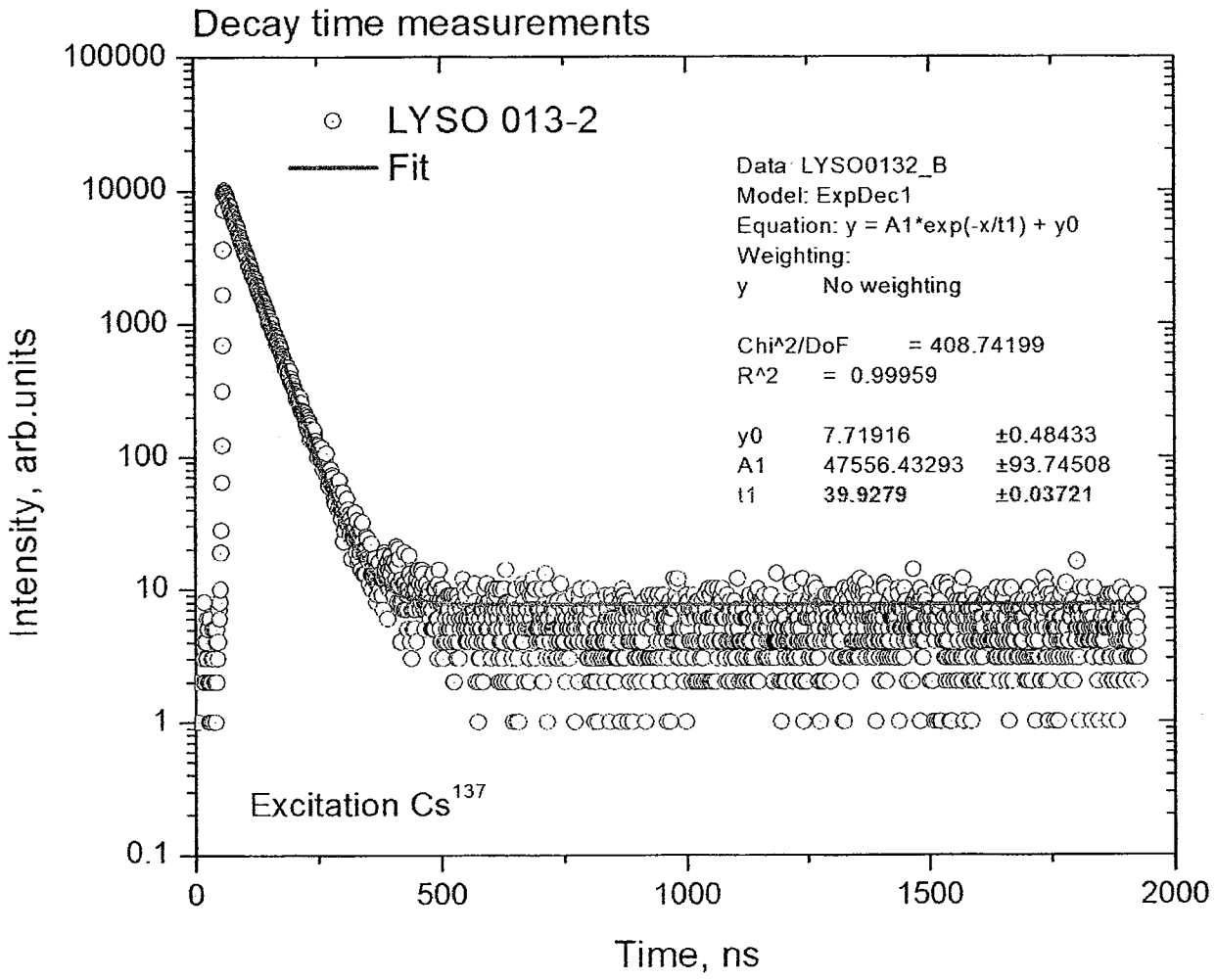
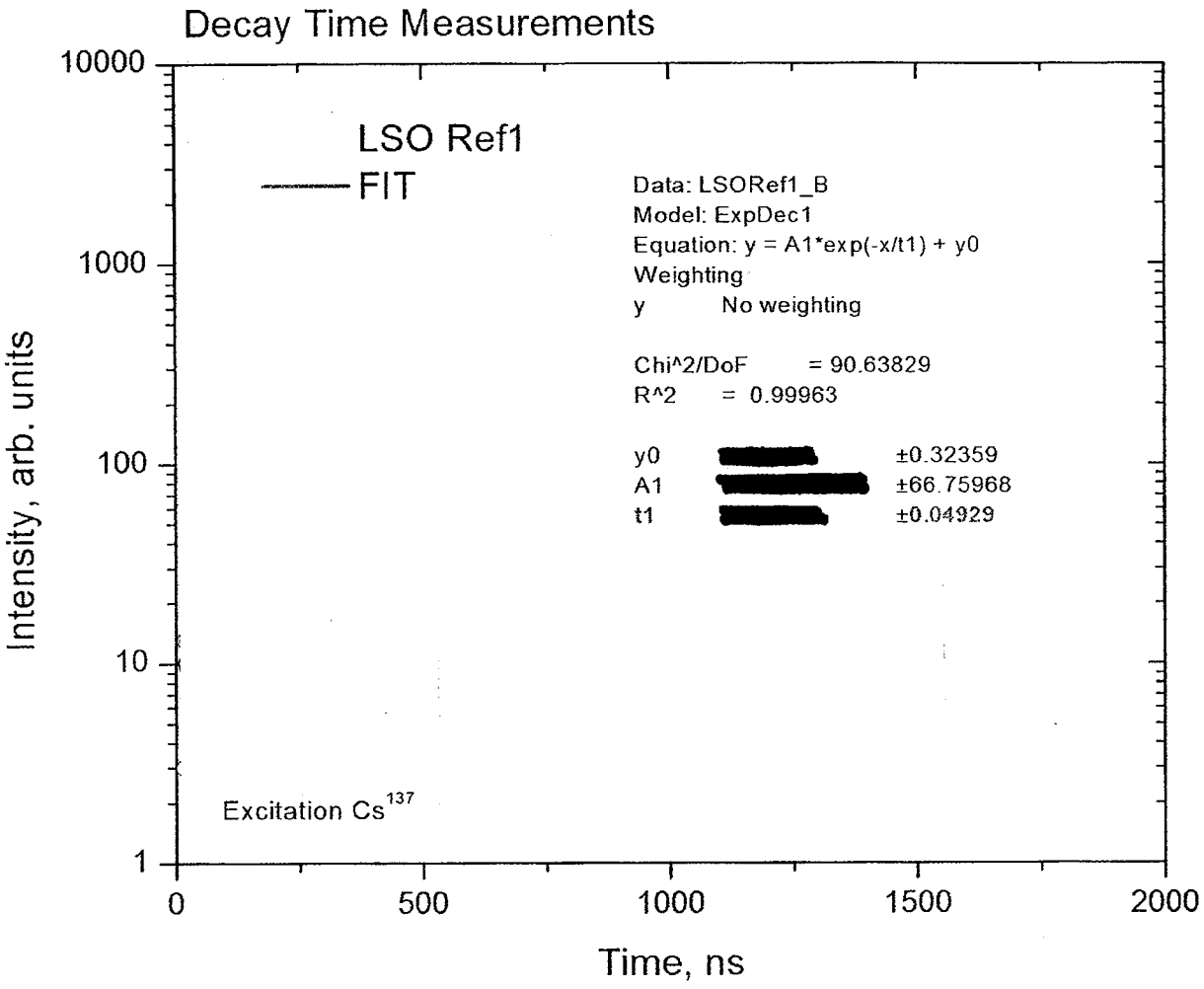
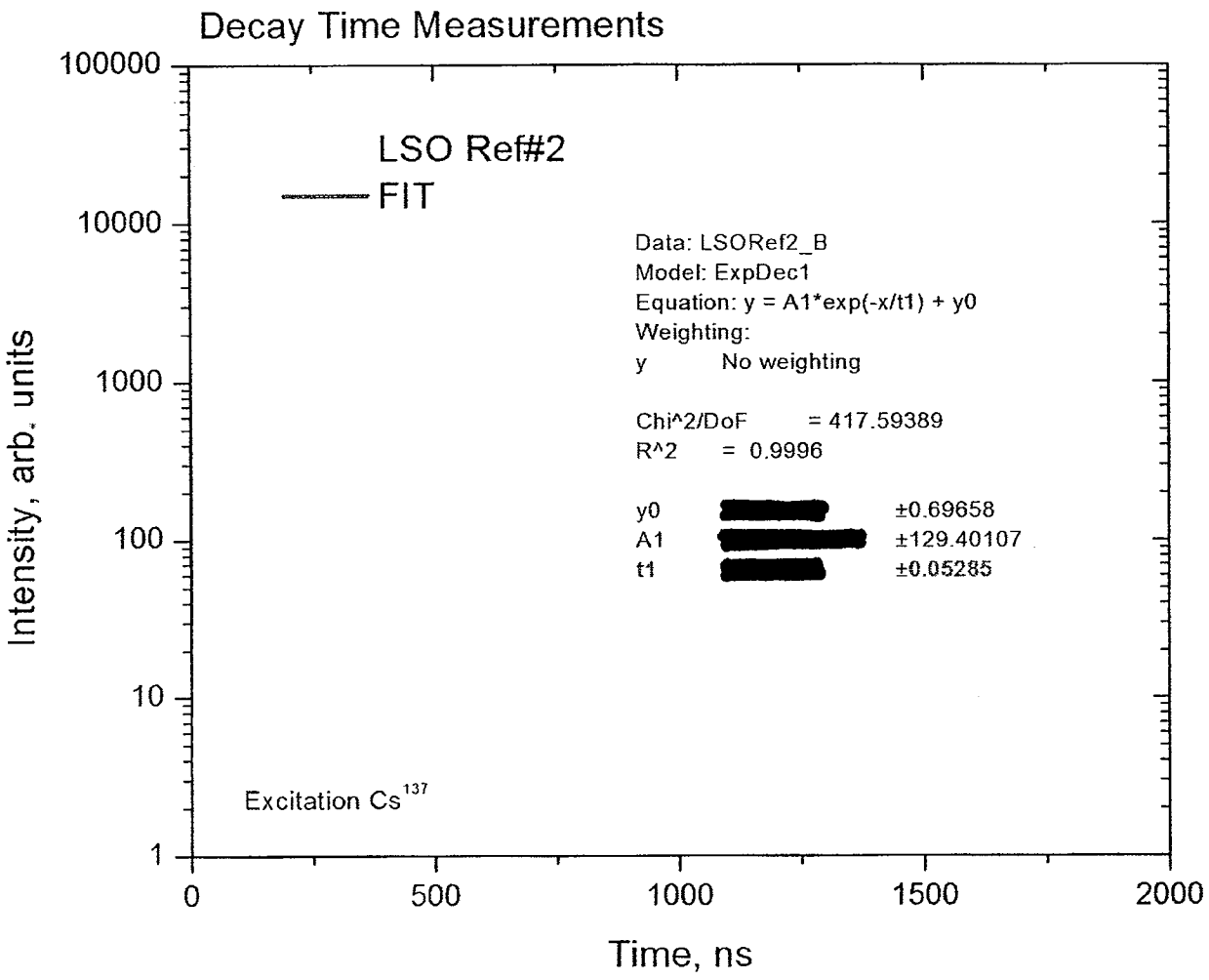

Radioluminescence measurements
X-ray generator:
35kV, 100μA
LYSO 013-1
LYSO 013-2
LSO Ref#1
LSO Ref#3
Intensity, arb.units
1.0
0.8
0.6
0.4
0.2
0.0
300
400
500
600
Wavelength, nm

EXHIBIT I


Decay time measurements
LYSO 013-1
Fit
Data: LYSO0131_B
Model: ExpDec1
Equation: y = A1*exp(-x/t1) + y0
Weighting
y No weighting
Chi^2/DoF = 418.70427
R^2 = 0.9996
y0 9.79394 ±0.49359
A1 49008.81969 ±96.61201
t1 39.16437 ±0.0364
Excitation Cs137
Intensity, arb.units
Time, ns
100000
10000
1000
100
10
1
0
500
1000
1500
2000


Decay time measurements
LYSO 013-2
Fit
Data: LYSO0132_B
Model: ExpDec1
Equation: y = A1*exp(-x/t1) + y0
Weighting:
y No weighting
Chi^2/DoF = 408.74199
R^2 = 0.99959
y0 7.71916 ±0.48433
A1 47556.43293 ±93.74508
t1 39.9279 ±0.03721
Excitation Cs137
Intensity, arb.units
Time, ns
100000
10000
1000
100
10
1
0.1
0
500
1000
1500
2000


Decay Time Measurements
LSO Ref1
FIT
Data: LSORef1_B
Model: ExpDec1
Equation: y = A1*exp(-x/t1) + y0
Weighting
y No weighting
Chi^2/DoF = 90.63829
R^2 = 0.99963
y0 ±0.32359
A1 ±66.75968
t1 ±0.04929
Excitation Cs137
Intensity, arb. units
Time, ns
10000
1000
100
10
1
0
500
1000
1500
2000


Decay Time Measurements
LSO Ref#2
FIT
Data: LSORef2_B
Model: ExpDec1
Equation: y = A1*exp(-x/t1) + y0
Weighting:
y No weighting
Chi^2/DoF = 417.59389
R^2 = 0.9996
y0 ±0.69658
A1 ±129.40107
t1 ±0.05285
Excitation Cs137
Intensity, arb. units
Time, ns
100000
10000
1000
100
10
1
0
500
1000
1500
2000